

REMARKS

Some typographic corrections have been introduced as amendments. Some of the rejected claims have been amended and two new claims have been added. No new matter has been added.

Applicant submits this Amendment "C" and Response for the Examiner's consideration. Reexamination and reconsideration of the application, as amended, in view of the following remarks are respectfully requested.

1. STATUS OF THE CLAIMS

Claims 1-44 were presented for examination; claims 34-44 are withdrawn from consideration and claims 1-33 stand rejected and pending in the application. New claims 45-46 have been added. Claims 1-33 are rejected under 35 U.S.C. § 112 ¶ 2. Some of the rejected claims have been amended. Claims 2-4 stand rejected under 35 U.S.C. § 112 ¶ 1. These rejections are traversed below. Claims 1-32 stand rejected under 35 U.S.C. § 103(a). These rejections are traversed below.

The Office Action mailed October 8, 1997, stated that Claims 1-4 and 14-19 are generic. As Applicants have demonstrated above the allowability of these generic claims over the art of record, Applicants also respectfully assert that Applicants are entitled to consideration of claims to additional species, and particularly unelected Claims nnce 34-42 and new Claims, as amended and set forth herein.

2. RESPONSE TO REJECTIONS

2.1. *Claim Rejections Under 35 U.S.C. § 112 ¶ 1*

Claims 2-4 stand rejected under 35 U.S.C. § 112 ¶1. The Office Action alleges that "[t]here is no description in the specification as originally filed of implanting more than one 'type' of ion as recited."

Claims 2-4 recite directly or by incorporation from a parent claim "ions different from said ions of said first material". Applicants note that the specification as originally filed refers directly and impliedly in numerous occasions to silicon ions and to other different ions. The specification recites, for example: (a) "ions of the selected type providing an increased availability of a source material", Application, p. 9, *ll.* 1-2; (b) implanted ions also comprise silicon. Other types of ions may also be implanted together with the selected type of ions", Application, p. 9, *ll.* 5-6; (c) "when oxidizing layers of material other than silicon, suitable ions that provide a source for the corresponding reaction would be selected", Application, p. 9, *ll.* 13-15; (d) reference is made in numerous instances to ions of a selected type with certain properties, *see, e.g.*, Application, p. 11, *ll.* 4-14, p. 17, *ll.* 6-15, 21, p. 18, *l.* 1, p. 19, *l.* 2. The foregoing cites and quotes to material in the Application are offered as illustrative examples of support for the recitation of claims 2-4, but not as interpretive limitations. Passages of the Application as filed such as those quoted and cited hereinabove provide description in the specification of the implantation of more than one type of ion as recited in claims 2-4. For this reason, Applicants respectfully submit that claims 2-4 comply with 35 U.S.C. § 112 ¶ 1, and reconsideration and withdrawal of this rejection are respectfully requested.

2.2. Claim Rejections Under 35 U.S.C. § 112 ¶ 2

Claims 1-33 stand rejected under 35 U.S.C. § 112 ¶ 2. The Office Action alleges that the rejected claims are indefinite on the basis of a number of terms quoted from claims 1, 2, 10, 25, and 33. Each one of these claims and the terms quoted in the Office Action are addressed in turn below.

2.2.1. Claim 1. Use of the term "predetermined"

The term "predetermined" has been deleted in claim 1 and in every other claim in which this term was used.

2.2.2. Claim 2. Use of the term "type"

The terms "of a type other than" have been changed to --different from--.

2.2.3. Claim 2. Suggested addition of the terms "further comprising"

New claim 46 has been added reciting the terms "further comprising" as suggested by the Examiner. Claim 2 has been amended and new claim 45 has been added to recite different possibilities supported by the written description. *See, e.g.,* Application, p. 9, *ll.* 5-6, p. 11, *ll.* 4-14.

2.2.4. Claims 10, 25 and 33. Use of the term "minimum"

This term has been deleted in the relevant claims.

In light of the amendments introduced as explained hereinabove, Applicants respectfully submit that claims 1-33 comply with 35 U.S.C. § 112 ¶ 2, and reconsideration and withdrawal of these rejections are respectfully requested. In particular, Applicants submit that the only ground under which claim 33 was rejected is now removed, because this claim was rejected only under 35 U.S.C. § 112 ¶ 2.

2.3. First Set of Claim Rejections Under 35 U.S.C. § 103(a)

The following claims:

Independent claim 1, and dependent claims 2-6, 11, and 13-17; and

Independent claim 20, and dependent claims 21, 24, 26, and 29-31;

stand rejected under 35 U.S.C. § 103(a) as obvious over Japanese Patent 62-48028 (hereinafter "JP'028") in view of Wolf, vol. 1, pp. 323-24 (hereinafter "Wolf").

JP'028 requires the presence of a silicon dioxide film in the field region that is subjected to ion implantation. JP'028 differs from the invention recited in the rejected claims in that, according to JP'028, the ions must first be passed through a layer of silicon dioxide that is 500Å thick before

the ions are implanted into an underlying layer of silicon. The layer of silicon is not exposed during implantation. JP'028 teaches that a 500Å layer of silicon dioxide is necessary to prevent contamination.

The presence of this layer of silicon dioxide during implantation presents a variety of difficulties and obstacles that are overcome by the claimed invention. Implanting a 500Å thick layer of silicon dioxide requires elaborate and high powered implantation equipment. The layer of silicon dioxide makes the implantation process more difficult to control because the ions are scattered as they bombard the layer of silicon dioxide. The scattering of the ions results in an implanted region in the silicon layer that is larger and exhibits more lateral straggle in the resultant implanted profile than if the layer of silicon dioxide were not present.

The presence of the 500Å thick layer of silicon dioxide in JP'028 slows down the subsequent oxidation process, which in turn permits a greater degree of undesirable lateral straggle in the resultant oxidized region. This straggle works against one of the objectives of the claimed invention that is the reduction of bird's beak structures in field oxide regions and of the problems accompanying these structures.

In contrast, the rejected claims recite methods that do not rely on the film of silicon dioxide in the field region that is required by JP'028. Thus, the claimed methods are not restricted to their implementation with the silicon dioxide film required by JP'028.

Because of the limitations in its teachings, JP'028 does not teach or suggest the claimed methods. Furthermore, the problems solved by the claimed invention would not be solved by the implementation of the teachings provided by JP'028, which in contrast relies on the presence of a silicon dioxide film in the field region to be subjected to ion implantation. Thus, the methods that

lead to the solutions provided by the rejected claims would not have been sought by adopting the experiments disclosed in JP'028.

Because of differences and limitations such as those described hereinabove, JP'028 has not suggested the claimed subject matter, and it may not be asserted that the teachings provided by JP'028 are sufficient for one of ordinary skill in the art to make the substitutions, combinations or other modifications that are necessary to arrive to the claimed invention.

In addition, JP'028 does not provide any suggestion or teaching that the claimed invention should have been carried out and would have had a reasonable likelihood of success in light of experiments that are implemented in JP'028. To this respect, the Federal Circuit has explained that “[t]he consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that this process should be carried out and would have a reasonable likelihood of success.” (Citations omitted). *Rockwell Int'l Corp. v. United States*, 147 F.3d 1358, 47 U.S.P.Q.2d 1027, 1033 (Fed. Cir. 1998). In addition, “[b]oth the suggestion and the expectation of success must be founded in the prior art, not in applicant's disclosure.” *In re Dow Chemical Co.*, 837 F.2d 469, 473 (Fed. Cir. 1988).

Furthermore, in light of these differences and limitations in JP'028, “a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *United States v. Adams*, 383 U.S. 39, 52 (1966). See also *W.L. Gore & Assocs. v. Garlock, Inc.*, 721 F.2d 1540, 1550-51 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Consequently, Applicant respectfully submits that JP'028 does not support a *prima facie* case of obviousness regarding claims 1-6, 11, 13-17, 20-21, 24, 26, 29-31 because “[t]o establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by

the prior art.” M.P.E.P. § 2143.03, p. 2100-100 (Rev. 1, Feb. 2000), citing *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974). As reasoned hereinabove, however, JP’028 does not satisfy this requirement.

Before analyzing the remaining references that are cited in the Office Action in combination with JP’028, Applicants note that none of such references provides any basis that would overcome the limitations set forth above with respect to JP’028. Therefore, even if JP’028 could be combined with one or several of the cited references, such combination would not teach or suggest the claimed invention. To this respect Applicants note that it has not been established that the claimed invention as a whole is obvious in light of the cited references because the differences and limitations in JP’028 are not overcome by any of the remaining cited references. *See* M.P.E.P. § 2141.02, p. 2100-94 (Rev. 1, Feb. 2000). Furthermore, as shown herein, the three basic requirements of a *prima facie* case of obviousness have not been established for the rejected claims in light of JP’028 or in light of JP’028 combined with any one of the remaining cited references. These requirements are (a) there must be some suggestion or motivation in the prior art to modify the reference or to combine reference teachings, (b) there must be a reasonable expectation of success in light of the prior art teachings, and (c) the prior art reference or references must teach or suggest all the claim limitations. *See* M.P.E.P. §§ 2142-43, p. 2100-97 (Rev. 1, Feb. 2000).

It has not been established, in particular, that Wolf provides any basis that would overcome the limitations and differences established with respect to the disclosure in JP’028. As indicated in the Office Action, Wolf discloses the effects of ion implantation through surface layers and provides two reasons for using such layers. The reasons include avoiding contamination and reducing the fraction of channeled ions for both axial and planar channeling conditions because of the scattering in random directions of the incident ions by the surface layer. Accordingly, Wolf reinforces the

conventional wisdom of using a surface layer as required in JP'028. In contrast, the claimed invention does not require such surface layer. Therefore, Wolf and JP'028 teach according to the conventional wisdom of using a surface layer through which ion implantation takes place, and the same references teach away from the claimed methods that do not rely on such surface layer. To this respect, Applicants note that "proceeding contrary to accepted wisdom in the art is evidence of nonobviousness". M.P.E.P. § 2145.X.D.3, p. 2100-123 (Rev. 1, Feb. 2000), citing *In re Hedges*, 783 F.2d 1038, 228 U.S.P.Q. 685 (Fed. Cir. 1986). As reasoned above, the claimed methods proceed contrary to accepted wisdom in the art because they do not rely on the accepted wisdom established in JP'028 and Wolf.

As shown in the Office Action, both JP'028 and Wolf teach the use of a surface layer through which ion implantation is performed. One of the functions of such layer is to prevent contamination of the underlying silicon surface. Even though avoiding contamination is a desirable goal, the claimed methods do not rely on the presence of a surface layer and yet achieve ion implantation to solve the problems addressed by the present invention. To this respect, Applicants note that "the omission of an element and retention of its function is an indicia of unobviousness." M.P.E.P. § 2144.04.II.B, p. 2100-104 (Rev. 1, Feb. 2000), citing *In re Edge*, 359 F.2d 896, 149 U.S.P.Q. 556 (C.C.P.A. 1966). Therefore, the teachings in JP'028 and Wolf provide indicia of unobviousness of the present claims because these claims recite methods that omit the surface layer element while achieving ion implantation that is not impeded by contamination.

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Furthermore, even if Wolf were combined with JP'028, the combination would not teach, disclose or even refer to the claimed methods; therefore, neither JP'028 nor Wolf combined with JP'028 may render the subject matter recited in such claims obvious.

As to the combination of JP'028 and Wolf, it has not been shown that there is a motivation to combine the teachings in these references to arrive to the claimed methods. To this respect, the Federal Circuit has stated that "[n]othing in the references alone or in combination suggests the claimed invention as a solution to the problem That the claimed invention may employ known principles does not itself establish that the invention would have been obvious." 730 F.2d 1452, 221 U.S.P.Q. 481, 488-89. Furthermore,

Obviousness cannot be established by combining the teaching of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination. Under section 103, teachings of references can be combined only if there is some suggestion or incentive to do so. The prior art of record fails to provide any such suggestion or incentive.

ACS Hosp. Sys., Inc. v. Montefiore Hosp., 732 F.2d 1572, 221 U.S.P.Q. 929, 933 (Fed. Cir. 1984). See also M.P.E.P. § 2143.01, pp. 2100-98,99 (citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990); *In re Fritch*, 972 F.2d 1260, 23 U.S.P.Q.2d 1780 (Fed. Cir. 1992)); M.P.E.P. § 2145.X.C, p. 2100-122 (Rev. 1, Feb. 2000).

Consequently, Applicant respectfully submits that neither JP'028 nor Wolf supports a *prima facie* case of obviousness regarding claims 1-6, 11, 13-17, 20-21, 24, 26, 29-31. Applicants respectfully request the reconsideration and withdrawal of this rejection.

2.4. Second Set of Claim Rejections Under 35 U.S.C. § 103(a)

Dependent claims 7-10 (which depend from independent claim 1);
dependent claims 22-23 (which depend from independent claim 20); and
independent claim 32;

stand rejected under 35 U.S.C. § 103(a). The Office Action alleges that the rejected claims are unpatentable over JP'028 in view of Wolf as applied to the claims addressed in the preceding

section, and further in view of Japanese Patent 63-300526 (hereinafter "JP'526"). Office Action, pp. 3-4.

Applicants incorporate the foregoing reasons, cites and quotes with respect to JP'028 and Wolf to the following traversals regarding the additional combination with JP'526. In addition, Applicants note as follows regarding this combination.

JP'526 discloses the use of silicon nitride as oxide-proof film in anisotropic etching. However, JP'526 does not provide any basis that would overcome the limitations set forth above with respect to JP'028 and/or Wolf. Therefore, even if JP'028 could be combined with Wolf and/or JP'526, such combination would not teach or suggest the claimed invention. In addition, it has not been established that there is any motivation or suggestion in the references or in the art to modify or combine these references.

For reasons such as those set forth above, neither JP'028 nor JP'028 combined with Wolf and/or JP'526 may render the subject matter recited in the rejected claims obvious. Consequently, Applicants respectfully submit that these references do not support a *prima facie* case of obviousness regarding claims 7-10, 22-23, and 32. Applicants respectfully request the reconsideration and withdrawal of this rejection.

2.5. Third Set of Claim Rejections Under 35 U.S.C. § 103(a)

Dependent claims 12 and 18-19 (which depend from independent claim 1); and dependent claims 24-25 and 27-28 (which depend from independent claim 20); stand rejected under 35 U.S.C. § 103(a). The Office Action alleges that the rejected claims are unpatentable over JP'028 in view of Wolf as applied to the claims addressed in the preceding subsections and further in view of additional comments. Office Action, p. 4.

Applicants incorporate the foregoing reasons, cites and quotes with respect to JP'028 and Wolf to the following traversals regarding the combination with additional comments set forth in the Office Action. In addition, Applicants note as follows regarding this combination.

The comments in the Office Action do not provide any basis that would overcome the limitations set forth above with respect to JP'028 and/or Wolf. Therefore, even if JP'028 could be combined with Wolf and/or the comments set forth in the Office Action, such combination would not teach or suggest the claimed invention. Furthermore, Applicants note that the Office Action does not provide any reference that would teach or suggest retaining a photoresist mask during ion bombardment or any other of the modifications referred to in the comments when the claimed invention is considered as a whole. To this respect, Applicants note that "the question under 35 U.S.C. 103 is not whether the differences themselves would have been obvious, but whether the claimed invention as a whole would have been obvious." (Underlined text in the original) M.P.E.P. § 2141.02, p. 2100-94 (Rev. 1, Feb. 2000), citing *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d 1530, 218 U.S.P.Q. 871 (Fed. Cir. 1983); *Schenck v. Nortron Corp.*, 713 F.2d 782, 218 U.S.P.Q. 698 (Fed. Cir. 1983).

For reasons such as those set forth above, neither JP'028 nor JP'028 combined with Wolf and/or the comments provided in the Office Action may render the subject matter recited in the rejected claims obvious. Consequently, Applicants respectfully submit that these references do not support a *prima facie* case of obviousness regarding claims 12, 18-19, 24-25, and 27-28. Applicants respectfully request the reconsideration and withdrawal of this rejection.

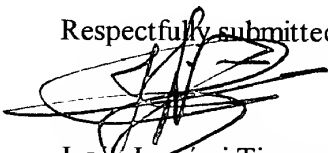
3. CONCLUSIONS

In view of the above, Applicants respectfully maintain that the present application is in condition for allowance. Reconsideration of the rejections is requested. Allowance of claims 1-33 and 45-46 at an early date is solicited.

In the event that the Examiner finds any remaining impediment to a prompt allowance of this application which could be clarified by a telephonic interview, or which is susceptible to being overcome by means of an Examiner's Amendment, the Examiner is respectfully requested to initiate the same with the undersigned attorney.

Dated this 25th day of January 2001.

Respectfully submitted,



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